

**UNITED STATES AGENCY FOR INTERNATIONAL  
DEVELOPMENT**

**Enterprise Energy Efficiency (3E) Project**

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***BIJELJINA STREET LIGHTING  
PILOT PROJECT PROPOSAL No. B4-3***

**Author: Zoran Morvaj, Chief of Party**

**April 18, 2012**

Implemented by:  
Advanced Engineering Associates International, Inc. (AEAI)



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**Enterprise Energy Efficiency - 3E**

***PILOT PROJECT PROPOSAL No. B4-3***  
***BIJELJINA STREET LIGHTING***

**SITE VISIT REPORT AND PILOT PROJECT PROPOSAL EVALUATION**

**Zoran Morvaj**  
**Chief of Party**

Sarajevo, April 18, 2012

## ***CONTENTS***

1. PILOT PROJECT PROPOSAL SCREENING REPORT
2. PROJECT EVALUATION SUMMARY
3. PROJECT TECHNICAL DESCRIPTION AND ANALYSIS

## ***ATTACHMENT***

- A. LETTER FROM THE MAYOR OF THE BIJEJINA MUNICIPALITY

# 1. Pilot Project Proposal Screening Report

## ***I Partners:***

Bijeljina Municipality

## ***II Proposed EE measures after USAID 3E analysis:***

1. Changing of street light fixtures	\$100,000
<b>Total cost of proposed EE measures</b>	<b>\$100,000</b>

## ***III Co-funding contributions:***

1. Direct co-funding from partner's own funds;	
Bijeljina Municipality	\$35,000
2. Partner co-financing from borrowed funds;	0
3. Other donors' co-funding:	
UNDP	\$32,500
4. Provision of works and services (e.g., decommissioning of old equipment, installation of new equipment, design and supervision services, monitoring and verification (M&V));	0
5. Provision of materials and equipment (e.g., piping, wiring, insulation material, control equipment); and	0
6. Partnership with a private sector partner that might contribute any of above.	0
<b>Total confirmed co-funding by partner/donors:</b>	<b>\$67,500</b>

## ***IV Co-funding by USAID 3E:***

<b>Total 3E Project co-funding based on best estimate:</b>	<b>\$32,500</b>
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## ***V Compliance with criteria for selection:***

1. Replicability potential and relative ease of implementation;	0 - 12	12
2. Readiness and ability to put in place clear M&V procedures for reporting on post-implementation energy savings;	0 - 12	12
3. Appropriate geographic location, building type and types of technologies so that the total portfolio of 10 pilot projects when implemented demonstrates various EE measures, technologies and practices applied to different building types or EE practices and are located across the country;	0 - 24	24
4. Amount of co-financing for the pilot project that the partner is willing to or able to secure, or the amount of assistance the pilot project can obtain from other donors or private sector;	0 - 24	18
5. For the public sector - willingness to introduce energy management practices into other public buildings that are responsibility of the partner;	0 - 12	10
6. For municipalities - readiness to sign the EU Covenant of Mayors on EE;	0 - 4	4
7. For all – a willingness to support the raising of EE awareness of building users and citizens at large.	0 - 12	12
<b>Total:</b>	<b>100%</b>	<b>92%</b>

## ***VI Environmental Compliance:***

Confirm that the pilot project implementation does not cause any environmental concerns or adverse environmental effects.	Yes
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## **2. Project evaluation summary**

### **2.1 Basic data about the project:**

- Project is to reduce electric energy consumption of the street lighting in Bijeljina
- Number of light poles = 118
- Number of lights = 52 lights – 125W, 112 lights – 250W (all are currently mercury vapor bulbs)
- Total installed capacity = 34,500W
- Average operating hours per day = 11 h
- Number of operating hours per year =  $11 \times 365 = 4015\text{h}$
- Total electric energy consumption per year = 138 MWh
- Electrical energy cost = 0.1508 KM/kWh (0.116 \$/kWh)
- Total electrical energy cost per year = 20,900 KM (\$16,000)

### **2.2 Recommended measure:**

1. Replacement of existing street lighting with high pressure sodium lights.
2. Replacement of existing park lighting with LED lights.

### **2.3 Rationale:**

1. Mercury vapor lamps, which are a majority of the installed lights, are an obsolete technology for street lighting, and they are not energy efficient.
2. These measures can be replicated across Bosnia and Herzegovina, since most of the street lighting systems across the country are outdated.

### **2.4 Benefits:**

- Large energy savings.
- Better road visibility.
- Stimulation of local economy, as local firms will be hired to do the works.
- Increased energy efficiency awareness of the local government.
- Practical demonstration of benefits of new energy efficient lighting technologies.
- Demonstration of energy savings through LED lighting technology.
- Increase of public awareness of benefits of energy efficiency measures and that energy costs should not be regarded as a fixed cost.
- Motivation of local governments to financially support such projects.
- Reduction of CO<sub>2</sub> emissions.
- Improvement of public health.

## 3. Project Technical Description and Analysis

### 3.1 Introduction

The Bijeljina Municipality is interested in reducing energy consumption and to that end has signed the Covenant of Mayors. In achieving the targeted reduction in overall energy consumption, reduction in street lighting consumption plays an important role. Representatives of the Bijeljina Municipality contacted 3E and proposed the public street lighting as a 3E pilot project, followed by the receipt of an official proposal signed by the Municipality Mayor.

The proposed pilot project represents improvement of the energy efficiency of the public lighting in three streets and the central park in Bijeljina. The proposal is to replace existing street lamps (Figure 1 and 2) with high pressure sodium lamps and replacement of the park lights (Figure 3 and 4) with Light Emitting Diodes (LED) lights. Through this project 3E can demonstrate energy efficiency measures for public lighting for towns that use old and/or obsolete technology.

The 3E team visited the proposed facility, performed a walk-through audit and collected relevant information:

### 3.2 Site visit report

Legal regulations provide that general utility consumption is under the jurisdiction of the municipal administration. Municipal utility consumption includes the costs of electricity and maintenance of the public light system, cost of water in public fountains and hydrants, and the maintenance cost of public green area and parks.



Figure 1. – Street lights in Bijeljina



Figure 2. – Street lights in Bijeljina



Figure 3. – Park lights in Bijeljina



Figure 4. – Park lights in Bijeljina

**3.3 Technical and financial analysis** The main problem of the public lighting system in Bijeljina municipality is the high cost of the high consumption and inefficient technology currently used in the public lighting system in the Bijeljina Municipality. The majority of the lights are mercury light bulbs with a few halogen and sodium bulbs. As a result, 95% of the electricity in the public lighting system is lost in the form of heat energy. The only way to decrease the mentioned costs is to increase the efficiency of the lights used in the public light system by changing the technology used.

Another problem with the technology currently used is the frequent burn-out of the light bulbs due to their technical characteristics and age.

Bijeljina Municipality allocates significant funds for payment of maintenance and electricity costs for the public lighting system, which in total is 1,5 million KM per year.

The estimated before and after measures electricity consumption and cost per year is shown in table 1. The large energy saving of more than 40% is because the High pressure sodium and LED street light technology is much more efficient and also because the existing system was oversized.

**Table 1. Electrical energy consumption**

Energy carrier	Unit	Present	After measures	Savings
Electricity	MWh	138	83	55
	\$	16,000	9600	6400

The reduction of CO<sub>2</sub> emissions achieved by implementation of the measures is 17 tons per year.

The cost for the measures and the payback period is shown in table 2. It is assumed that the price per kWh remains the same. Apart from the large energy savings, a significant saving in maintenance costs is also important. The LED street lights have an up to 5 times longer lifetime and do not suffer from significant lumen depreciation, while mercury vapor lights

produce approximately 50% less light every five years used. The rated lifetime of LED lights is 50,000h (more than 12 years), high pressure sodium has a rated lifetime of around 20,000h, while mercury vapor lights are rated at 10,000h. Based on this, a savings of approximately \$15,000 in maintenance costs will be achieved for the 164 lights evaluated in 12 years. This is approximately a saving of \$1,250 in maintenance costs per year.

**Table 2. Preliminary cost and benefit analysis for recommended measures**

Measures	Investment [\$]	Annual Energy and Maintenance Savings Est [\$]	Simple payback period [year]
Changing of street light modules	100,000	7,650	13



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**LETTER FROM THE MAYOR OF THE TREBINJE MUNICIPALITY**